## REMARKS

Claims 1, 3, 13, 23, 27, 31 and 48-50 have been amended. Claims 1-3, 6, 8, 11-13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 remain in the application. Reconsideration of the application in view of the amendments and the remarks to follow is requested.

Claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 stand rejected under 35 U.S.C. §112, second paragraph. Claims 1, 3, 13, 23, 27, 31 and 48-50 have been amended to address concerns noted in the Office Action and/or to correct minor informalities noted during review, however, these amendments do not alter the scope of the claims. Accordingly, the rejections under 35 U.S.C. §112 should be withdrawn, and claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 should be allowed.

Claims 13 and 31 stand rejected under 35 U.S.C. §102(e) as being anticipated by Lapastora, U.S. Patent No. 5,782,399. Claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Trabucco, U.S. Patent No. 5,899,737, the publication to Kasulke et al. and Lapastora, U.S. Patent No. 5,782,399.

The §102 rejection of claims 13 and 31 is believed to be in error. Specifically, the PTO and Federal Circuit provide that §102 anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. *In re Spada*, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990). The corollary of this rule is that the absence from a cited

§102 reference of any claimed element negates the anticipation. *Kloster Speedsteel AB, et al. v. Crucible, Inc., et al.*, 793 F.2d 1565, 230 USPQ 81 (Fed. Cir. 1986).

Applicants note the requirements of MPEP §2131, which states that "TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM." This MPEP section further states that "'A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). 'The identical invention must be shown in as complete detail as is contained in the ... claim.' *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)."

The amendment to the specification is intended to clarify the meaning of the term "dip" as used herein, in light of confusion that the Examiner has expressed. No new matter is added by the amendment to the specification.

To clarify this further, Applicants point out that definitions of what is and what is not new matter are provided in the Manual of Patent Examination Procedure at §2163.07, entitled "Amendments to Application Which Are Supported in the Original Description".

This MPEP section states that "Amendments to an application which are supported in the original description are NOT new matter." In subsection

I, entitled "REPHRASING", this MPEP section states that "Mere rephrasing of a passage does not constitute new matter. Accordingly, a rewording of a passage where the same meaning remains intact is permissible. *In re Anderson*, 471 F.2d 1237, 176 USPQ 331 (CCPA 1973). The mere inclusion of dictionary or art recognized definitions known at the time of filing an application would not be considered new matter. If there are multiple definitions for a term and a definition is added to the application, it must be clear from the application as filed that applicant intended a particular definition, in order to avoid an issue of new matter and/or lack of written description."

Additionally, a copy of p. 613 of Merriam Webster's Collegiate Dictionary, 10$^{TH}$ Ed. (Merriam Webster, Springfield MA, principal copyright 1993) is included to clarify the meaning of the term "into" as it is ordinarily used in the English language. From these definitions, the Examiner should be able to see that no matter how "broadly" one reads the language of claims 13 and 31 or Lapastora, Lapastora provides no teaching of "dipping the substrate into a volume of the balls of solder", as recited in claims 13 and 31.

Further, Applicants note the requirements of MPEP §706.02. In a subsection entitled "DISTINCTION BETWEEN 35 U.S.C. 102 AND 103", this MPEP section states that: "The distinction between rejections based on 35 U.S.C. 102 and those based on 35 U.S.C. 103 should be kept in mind. Under the former, the claim is anticipated by the reference. No question of obviousness is present." In other words, it is inappropriate to modify the teachings of a reference in an effort to find anticipation.

Put another way, 35 U.S.C. §102 deals evidentiary rules for determining what is identically disclosed and enabled (see also MPEP §2121.01) in the public domain. For at least these reasons, the anticipation rejection of claims 13 and 31 is in error and should be withdrawn, and claims 13 and 31 should be allowed.

The Examiner states (pp. 4 and 5) that "The claimed feature of a "laser" can be broadly read as the highly focused Xenon light 32 beam used to bond the balls solder [sic] to the substrate." The Examiner is mistaken.

The specification has been amended to include a dictionary definition of the term "laser" as it is used in the relevant arts. The Examiner's "broad reading" gives the term "laser" a meaning repugnant to the normal meaning of the term as it is employed by those of ordinary skill in the relevant arts. It is inappropriate to give a term a meaning repugnant to the normal meaning of the term. This is explained in detail in MPEP §608.01(o), entitled "Basis for Claim Terminology in Description".

This MPEP section states that "The meaning of every term used in any of the claims should be apparent from the descriptive portion of the specification with clear disclosure as to its import; and in mechanical cases, it should be identified in the descriptive portion of the specification by reference to the drawing, designating the part or parts therein to which the term applies. A term used in the claims may be given a special meaning in the description. No term may be given a meaning repugnant to the usual meaning of the term."

The term "laser" is an acronym (p. 656, Merriam Webster's Collegiate Dictionary, 10TH Ed. (Merriam-Webster, Springfield MA, principal copyright 1993) for "Light Amplification by Stimulated Emission of Radiation". It is defined to mean "a device that utilizes the natural oscillations of atoms or molecules between energy levels for generating coherent electromagnetic radiation". A xenon flashlamp does not provide coherent electromagnetic radiation and thus is not a laser.

Not only does Trabucco not teach a laser, Trabucco teaches away from use of a laser beam for melting solder balls. Trabucco explicitly states that a beam of light from a xenon lamp is a preferred light source (see col. 2, lines 20-22; col. 3, line 58 through col. 4, line 2). Trabucco also explicitly states (col. 4, lines 5-8) that "As an alternative, a laser beam could be used, but suffers the disadvantage of being much more difficult to control, and being more likely to thermally shock the contact pad."

Trabucco explicitly teaches that lasers are disadvantageous and therefore should not be used. Trabucco also explicitly teaches that use of xenon flashlamps avoids the enumerated deficiencies that Trabucco finds to be associated with lasers.

Trabucco teaches away from the invention as recited in any of claims 2, 6, 8, 20, 22, 23, 26, 30, 36, 37, 49 and 50, all of which explicitly recite laser bonding of the solder balls.

The Examiner states (p. 5) that "Lapastora teaches an aligning process in which a substrate 20 has a frame (contact loading plate 72) with holes (openings 86) and the substrate or frame both are then tilted or *dipped* (see

Figure 7-9) to accurately position the balls of solder relative to the substrate for subsequent bonding." The Examiner is mistaken.

Lapastora does not teach using balls of solder. In fact, the words "solder ball", "balls of solder" or any equivalent thereto do not appear anywhere in Lapastora. Lapastora is silent as to what the spherical 32 contacts might be formed from.

Additionally, Lapastora teaches a method of soldering contacts to a substrate in the presence of solder paste 36 containing flux. More specifically, Lapastora teaches (col. 3, lines 64-67; col. 5, lines 33-35 and line 66 through col. 6, line 3; col. 6, lines 39-42) placement of solder paste 36 on each contact pad on the substrate 20.

Lapastora then teaches (col. 6, lines 59-61) pouring the contacts 32 on top of the contact loading plate 72. Lapastora teaches (col. 7, lines 37-39) pressing the contacts 32 into the paste 36. Lapastora teaches (col. 7, lines 50-52) soldering using an infrared heating process. Lapastora then teaches (col. 7, lines 53-55) removal of excess flux.

As such, Lapastora clearly teaches a flux-based soldering process. Flux is not desirable in laser-soldering processes for reasons that should be obvious to the Examiner.

In contrast, Trabucco teaches a fluxless method of melting solder balls (see, e.g., Title, Abstract, Background, Summary, Detailed Description). It is a main intent of Trabucco to eliminate flux from the soldering process. Trabucco teaches (col. 1, lines 39-49) that disadvantages to using flux include residues left on soldered items and necessitation of extra cleaning

steps. Trabucco teaches (col. 2, lines 27-30) that flux use generates additional waste products and that elimination of flux provides economy in manufacturing processes by elimination of cleaning steps and elimination of additional waste products. Trabucco further teaches (col. 4, lines 14-30) that fluxless soldering provides simpler and faster manufacturing, without need for cleaning processes after soldering.

Trabucco thus teaches away from the methods of Lapastora, and, conversely, Lapastora teaches away from the teachings of Trabucco. Further, either is rendered unsuitable for its intended purpose if adapted to include the teachings of the other.

Kasulke et al. also teach a fluxless bonding process. The Examiner correctly states (p. 6) that "It is well worth noting that both Kasulke et al. and Trabacco [sic], each share the common concept of bonding in the absence of flux." It is noted that Kasulke et al. do teach that many advantages flow from the absence of flux, including environmental benefits and reduction of manufacturing time and costs. However, what is not stated is that it is the main intention of Kasulke et al. and Trabucco to eliminate flux from soldering operations, and that either reference is rendered unsuitable for its intended purpose if adapted to conform to the teachings of Lapastora.

Applicants note the requirements of MPEP §2145(X), entitled "ARGUING IMPROPER RATIONALES FOR COMBINING REFERENCES", section D(2), which states, inter alia, that "<u>It is improper to combine references where the references teach away from their combinations</u>."

Applicants note the requirements of MPEP §2141.02, entitled "Differences Between Prior Art and Claimed Invention", stating that "PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS". This MPEP section further states that "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984)".

Applicants also note the requirements of MPEP §2143.01, entitled "Suggestion or Motivation to Modify the References", stating that "THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE". This MPEP section further states that "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)."

Accordingly, it is improper, as a matter of law, to attempt to combine the teachings of Lapastora with those of Trabucco or those of Kasulke et al. in an effort to find the invention as recited in any of Applicant's claims.

Further, simply stating a conclusion that "it would have been obvious" to combine teachings from references or to modify or augment teachings from a reference does not meet the standards for a rejection under 35 U.S.C. §103(a) as set forth in The Manual of Patent Examination Procedure at §706.02(j) entitled "Contents of a 35 U.S.C. 103 Rejection." This MPEP

section states that three basic criteria must be met in order to establish a prima facie case of obviousness. The first of these is that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine reference teachings. The Office Action fails to show that the subject matter of any of claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 is suggested or motivated by the teachings of the reference.

The second requirement of MPEP §706.02(j) is that there must be a reasonable expectation of success. The third requirement is that the prior art reference (or references when combined) must teach or suggest all of the claim limitations. Since all of the cited references are silent with respect to laser bonding, as recited in claims 6, 8, 20, 22, 23, 26, 30, 36, 37, 49 and 50, or dipping a substrate into a volume of solder balls, as recited in claims 1, 3, 13, 23, 27, 31 and 48, combining their teachings cannot possibly provide the invention as recited in any of Applicant's claims. As a result, there cannot possibly be a reasonable expectation of success from combining the teachings of the references.

The rejection of claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 fails all three components of the test for an obviousness rejection as set forth in the MPEP.

Further, no evidence has been provided as to why it would be obvious to combine the teachings of these references. Evidence of a suggestion to combine may flow from the prior art references themselves, from the

knowledge of one skilled in the art, or from the nature of the problem to be solved. However, this range of sources does not diminish the requirement for actual evidence. Further, the showing must be clear and particular. See *In re Dembiczak*, 175 F.3d 994, 998 (Fed. Cir. 1999).

For at least these reasons, the unpatentability rejection of claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 should be withdrawn, and claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 should be allowed.

Additionally, the Examiner's response to argument is deficient in multiple regards. Applicants note the requirements of MPEP §707.07, entitled "Completeness and Clarity of Examiner's Action". This MPEP section cites 37 CFR §1.104, entitled "Nature of examination" which in turn states, in subsection (b), entitled "Completeness of examiner's action" that "The examiner's action will be complete as to all matters, except that in appropriate circumstances, such as misjoinder of invention, fundamental defects in the application, and the like, the action of the examiner may be limited to such matters before further action is made."

This MPEP section further states, under a heading labeled "Examiner Note" that "The Examiner must, however, address any arguments presented by the applicant which are still relevant to any references being applied." The Office Action clearly fails to comport with these requirements as set forth in the MPEP.

Under the unpatentability rejections, the combinations fail to provide all of the features recited in any of Applicant's independent claims. The

Examiner has ignored these features without providing any appropriate legal basis for doing so.

Another deficiency is the failure to respond to all arguments traversing the unpatentability rejections. The Examiner has continued to rely on specific references for specific teachings without rebutting Applicant's legal arguments. Merely repeating that "it would be obvious" to provide the features recited in the claims does not constitute a basis for rejection of the claims, particularly when the references fail to provide the features recited in the claims and the rejections fail to meet the standards for such rejections as set forth in the MPEP and as demonstrated by Applicant.

For at least these reasons, the Office Action fails to comport with appropriate standards for examination. The Examiner should either allow Applicant's claims or provide a meaningful basis for rejection and an appropriate response to Applicant's arguments.

Further, Applicant herewith submits a duplicate copy of the Supplemental Information Disclosure Statement and Form PTO-1449 filed in this application on April 17, 2001. No initialed copy of the PTO-1449 has been received back from the Examiner. To the extent that the submitted reference listed on the Form PTO-1449 has not already been considered, and the Form PTO-1449 has not been initialed with a copy being returned to Applicant, such examination and initialing is requested at this time, as well as return of a copy of the initialed Form PTO-1449 to the undersigned.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page(s) are captioned "**Version with markings to show changes made**."

In view of the foregoing, allowance of claims 1-3, 6, 8, 11-13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45 and 48-50 is requested. The Examiner is requested to phone the undersigned in the event that the next Office Action is one other than a Notice of Allowance. The undersigned is available for telephone consultation at any time during normal business hours (Pacific Time Zone).

Respectfully submitted,

Dated: Oct. 8, 2001 By: _____
Frederick M. Fliegel, Ph.D.
Reg. No. 36,138

## Version with markings to show changes made

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. ..... 09/148,723
Filing Date .....September 3, 1998
Inventor ..... Warren M. Farnworth et al.
Assignee ..... Micron Technology, Inc.
Group Art Unit .....3729
Examiner .....D. Tugbang
Attorney's Docket No. ..... MI22-981
Title: Methods of Bonding Solder Balls to Bond Pads on a Substrate

## 37 CFR §1.121(b)(1)(iii) AND 37 CFR §1.121(c)(1)(ii) FILING REQUIREMENTS TO ACCOMPANY RESPONSE TO JULY 18, 2001 OFFICE ACTION

Deletions are bracketed, additions are underlined.

**In the Specification**

The paragraph extending from p. 4, line 18 to p. 5, line 9 has been amended as shown below.

The solder balls can be provided into frame-supported positions in a variety of ways. In one embodiment, individual solder balls 16 are delivered into holes 14 from over frame 10, as Fig. 1 implies. In another embodiment (Fig. 2) a plurality of solder balls 16 are provided over surface 12, at least some of which being deposited into at least some of holes 14. The balls can be provided over the surface in any manner. In the illustrated example, balls 16 are provided over surface 12 by rolling at least one, and preferably a plurality of the balls over the surface and into individual respective holes 14. The balls can be rolled over the frame surface until individual balls drop into individual associated holes. Alternately considered, frame 10 positioned in proximity to a substrate (not shown) to which conductive balls are to be bonded can be dipped into a volume of balls. The term "dip" means "to plunge or immerse momentarily or partially under the surface". Thereafter, the frame and substrate are removed from the volume of balls, with individual balls be received in respective frame holes. The balls are preferably small enough to pass through the holes.

The paragraph extending from p. 7, line 16 to line 24 has been amended as shown below.

Referring to Figs. 5 and 6, solder balls 16 are exposed to bonding conditions effective to bond the balls with their associated bond pads 22. In one embodiment, the solder balls are reflowed under such bonding conditions while they are within their individual holes. For example, the two leftmost balls in Fig. 5 and the three rightmost balls in Fig. 6 are seen to have been reflowed while within their individual holes. In a preferred embodiment, a laser-bonding system 24 is provided and solder balls 16 are laser-bonded with their associated bond pads. <u>The term "laser" means "a device that utilizes the natural oscillations of atoms or molecules between energy levels for generating coherent electromagnetic radiation".</u>

48. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over [a] the substrate by dipping the substrate into a volume of the balls of solder; and

while the ball portions are within the frame, exposing the balls to bonding conditions effective to bond the balls with their associated bond pads by laser bonding the balls with their associated bond pads.

49. (Amended) The method of claim 48, wherein [laser bonding] exposing the balls to bonding conditions effective to bond the balls comprises laser bonding the balls with their associated bond pads by fixing the position of a laser beam and moving the frame relative to the laser beam from ball-to-ball.

50. (Amended) The method of claim 48, wherein:

placing comprises placing individual balls within individual holes within the frame; and

[laser bonding] exposing the balls to bonding conditions effective to bond the balls comprises reflowing the balls by laser bonding while the balls are within their individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

**END OF DOCUMENT**